AFATL-TR-72-72

ANIMAL SURVEY STUDIES

OF

TEST AREA C-52A

EGLIN AFB RESERVATION, FLORIDA

PYROTECHNICS BRANCH
FLAME, INCENDIARY AND EXPLOSIVES DIVISION

TECHNICAL REPORT AFATL-TR-72-72

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AIR FORCE ARMAMENT LABORATORY
AIR FORCE SYSTEMS COMMAND • UNITED STATES AIR FORCE
EGLIN AIR FORCE BASE, FLORIDA

Animal Survey Studies

of

Test Area C-52A

Eglin AFB Reservation, Florida

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FOREWORD

The USAF project directly related to the information in this report is Exploratory Development Project 5066, Aerial Dissemination Techniques, work unit number 004. This report documents specific studies performed between May and October 1970. The majority of this report was presented at the February 1972 meetings of the Weed Science Society of America in St Louis, Missouri.

Information on the types and amounts of defoliants disseminated over Test Area C-52A was obtained from Armament Development and Test Center working papers "Defoliant History of Test Area C-52A" by Helen Biever, and from Vitro Services, Vitro Corporation of America.

This technical report has been reviewed and is approved.

FRANKLIN C. DAVIES, Colonel, USAF
Chief, Flame, Incendiary and Explosives Division

ABSTRACT

Between May and October 1970, an animal survey was conducted on a herbicide equipment test grid (Eglin Air Force Base Test Area C-52A) and the surrounding area. The purpose of the survey was to determine species variation and distribution patterns on the test grid and within the surrounding 11 square mile area. Methods of study included night and day field trips, and observations of the young of some animals were made in the field and in the laboratory. A trapping study was conducted to determine distribution patterns for the beach mouse (Peromyscus polionotus). Eighty-six species of vertebrates (mammals, birds, reptiles, amphibians and fish) were collected or observed in the field. Sixty-one species (mammals, birds, reptiles and amphibians) were found off the grid area, and 57% of these were also observed on the one square mile grid. Those animals found only in the area off the grid included seven mammals, six birds, eight reptiles, five amphibians, and fourteen fish. Ten species (one bird, five reptiles, two amphibians and two fish) were observed only on the grid. The beach mouse and/or the six-lined racerunner (Cnemidophorus sexlineatus) populations were considered to be ideal for future studies of population distribution. This study shows that a large number of animal species inhabited or frequented the herbicide equipment testing grid during a period when the grid received repetitive applications of the military herbicides White (2,4-dichlorophenoxyacetic acid and 4-amino-3,5,6-trichloropicolinic acid) and Blue (dimethylarsinic acid); and, after a period (January 1968 to December 1969) when the grid received repetitive applications of Orange (2,4-dichlorophenoxyacetic acid and 2,4,5-trichlorophenoxyacetic acid). In most cases, those differences that were found between species occurring on or off the grid could be accounted for on the basis of previously known habitat preferences.

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SECTION I

INTRODUCTION

From June 1962 to October 1970, aerial spray equipment was tested on Test Area C-52A in support of the military defoliation program. Active military defoliants such as Purple, Orange, White, and Blue were used in the majority of tests in order to obtain a realistic evaluation of spray equipment. The active ingredients in these defoliants are 2,4-dichlorophenoxyacetic acid (2,4-D), 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), 4-amino-3,5,6-trichloropicolinic acid (picloram) and dimethylarsinic acid (see Reference 1). Defoliants were repeatedly applied to 92 and 240 acre areas of the test area, resulting in some sections receiving approximately 947 pounds of active ingredient per acre (lb ai/A) of 2,4-D or 2,4,5-T; 53 lb ai/A of dimethylarsinic acid, and 8 lb ai/A of picloram during one or two year periods.

Between May 1970 and October 1970, a survey was conducted to determine the animal species composition of a one square mile test grid on Test Area C-52A, and the adjacent area included within a two mile radius of the center of the grid (Figure 1). The survey was initiated because of concern for the extent of ecological alterations that might occur in the test area as a result of the repetitive applications of military defoliants. The objective of the survey was to determine animal species variation and distribution patterns on the test grid and within the surrounding area.

Test Area C-52A occupies about three square miles and is about 100 feet above sea level. The soils of the area are predominantly well drained, acid sands of the Lakeland Association with 0 to 5% slope. The area is a grassy plain dominated by switchgrass (Panicum virgatum) and broomsedge bluestem (Andropogon virginicus). The surrounding forest (see range boundary in Figure 1) consists mainly of turkey oak (Quercus laevis), sand pine (Pinus clausa) and longleaf pine (P. palustris).

Earlier ecological studies (References 2 to 7) conducted on Test Area C-52A were primarily concerned with the types and distribution of plant species growing in the area and the effects of defoliant application on these parameters. Fish species found in the streams draining the test area were identified during a study by Lehn et al (Reference 8) to determine whether the Blue missions on the grids caused an increase in the levels of arsenic in the streams. The results of the study showed no increase in the arsenic levels, and only one species of fish showed any quantitative change.

During the eight years of testing spray equipment on Test Area C-52A, four grids were used to monitor the tests. Three 92 acre grids were used between June 1962 and April 1968. From May 1968 to October 1970, all tests were conducted on a one square mile grid which includes within its boundaries the area formerly occupied by two of the older grids. During the time of this animal survey, portions of the one-square-mile grid received approximately 43

lb ai/A of a combination of sodium cacodylate and dimethylarsinic acid (disseminated as Blue), 0.6 lb ai/A of picloram and 2 lb ai/A of 2,4-D (disseminated as White). The last Orange mission occurred in December 1969; portions of the one-square-mile grid had been sprayed in 1969 with about 139 lb ai/A of a combination of 2,4-D and 2,4,5-T disseminated as Orange. Aerial spray tests with the insecticide malathion were conducted on the one-square-mile grid in August 1970, but the animal survey had essentially been completed prior to the insecticide testing.

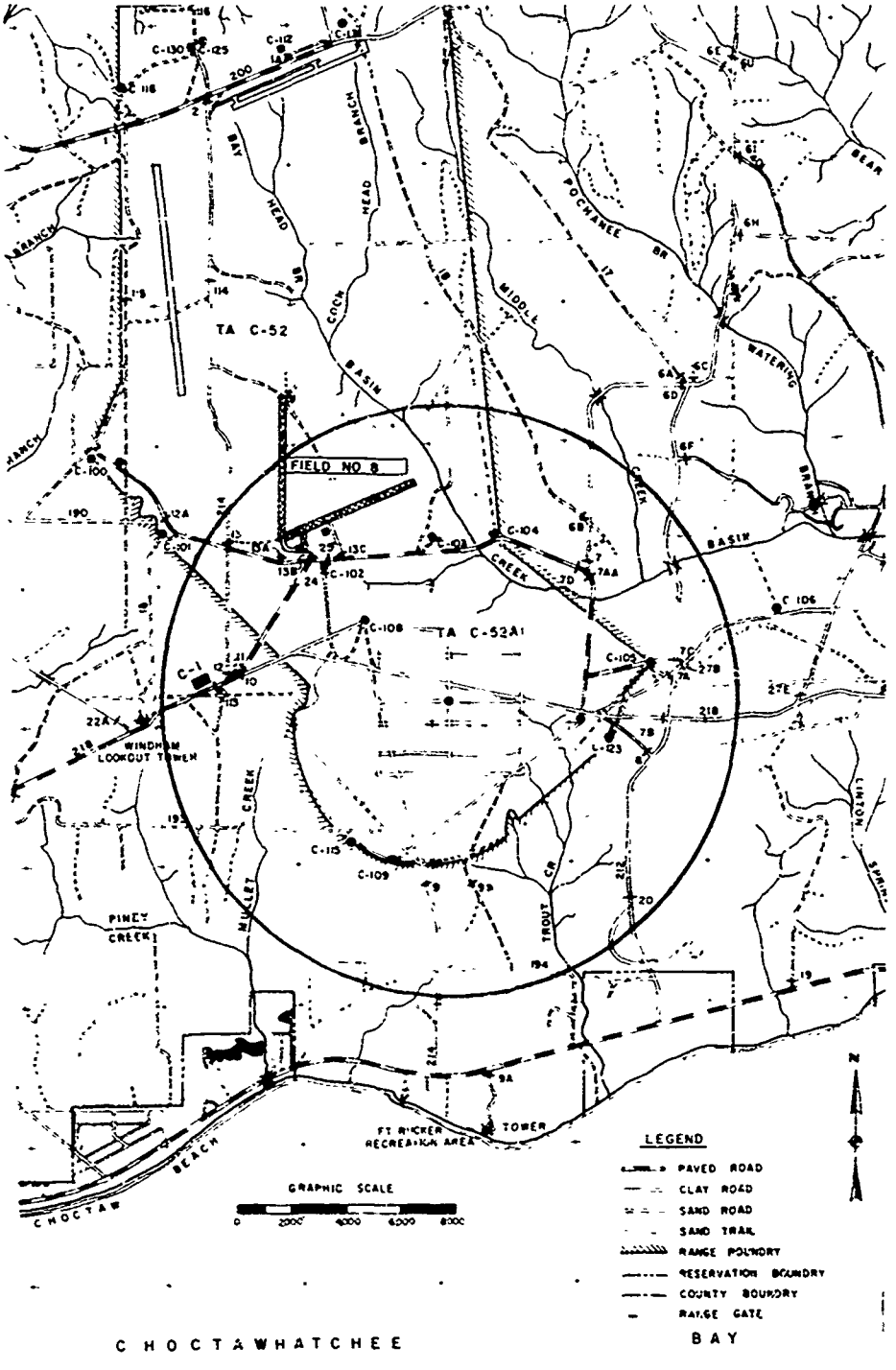

Figure 1. Test Area C-52A and Surrounding Area on Eglin AFB Reservation (Area Within Circle was Surveyed)

SECTION II

MATERIALS AND METHODS

Methods of study included early morning, midday, and night field trips on the one-square-mile grid and within the surrounding 11 square miles (Figure 1). The collecting and identification were concerned with mammals, birds, reptiles, amphibians, and fish. In addition to the field trips planned specifically for the survey (30 trips), data were also collected when trips were made to the test area for other reasons.

Many specimens collected were brought into the laboratory, preserved or mounted, and now serve as a reference collection to facilitate identification for subsequent studies. A large collection of 35mm slides of most of the animals was accumulated.

In addition to the surveys of animal species, preliminary studies were conducted on the distribution of the beach mouse (Peromyscus polionotus) on the test grid, and on the distribution of ant hills in 50 square meter transects on the grid. For the beach mouse studies, 35 live animal traps were constructed and set at randomly selected sites on the one-square-mile grid. Traps were in one location for two weeks, and then were moved to a new location. Three trapping sessions were conducted on the test grid and three in separate areas off the grid.

For the insect distribution study, a series of 16 randomly selected linear transects, 1 meter by 50 meters, were analyzed. The total number of ant hills in each 50 square meter area were counted, and the results were correlated with soil concentration of herbicide, the density of vegetation, and the relative soil moisture content within each transect. The relative concentration of herbicide residue in the grid soil had been determined by a plant bioassay (Reference 9).

SECTION III

RESULTS AND DISCUSSION

Mammals that were observed on or off the grid are shown in Table I. A total of 17 mammals were observed off the grid with 10 of these also found on the grid. All of the animals sighted on the grid used the area for foraging or as a source of drinking water. The most important economic population in the area was the deer herd. Night field trips yielded average counts of from 24 to 36 deer on the grid and within the immediate area. Close inspection of aquatic areas on the grid during early morning field trips revealed extensive activity the previous nights. In addition to the deer herd, a sizable herd of feral hogs earlier crossed with Russian Boars, also inhabited the area. The hogs frequented the marshy areas, drinking and rooting in the area for food.

During the spring of 1970, a red fox was frequently observed close to the grid and its den was found approximately 100 yards from the edge of the grid. Five kits were found in the den and based upon gross observations, they appeared healthy and normal.

The most common rodents off the grid along the streams that drain the area were the cotton mouse and the hispid cotton rat. In the fields surrounding the grid, the eastern harvest mouse was common. Eight pairs of the cotton mouse were taken into the laboratory and allowed to breed. Six of the pairs had litters which were normal in size and free from any apparent birth defects.

The most common rodent species on the grid is the beach mouse. Trapping studies during the summer of 1970 showed that this species is widely distributed throughout the grid, except in areas with less than 5% vegetative cover. A similar habitat preference is exhibited in their normal range along the beaches of the Gulf Coast.

At least 25 species of birds live in the area immediately adjacent to the grid or have been observed feeding within its boundaries. Many more species than those listed in Table II are found in the more densely forested areas near the outer limits of the two mile radius.

Seven species of water birds and waders were sighted repeatedly in the aquatic areas on or off the grid. Nine species of seed and insect gatherers were also observed feeding on or near the grid and the most common were the meadow lark and the mourning dove. Birds of prey and scavengers were well represented due to the high rodent population and good visibility afforded by an open area. It seems significant that all birds sighted, with the single exception of a grasshopper sparrow (caught in a live animal trap) were medium to large species. A thorough survey by a trained ornithologist would probably reveal more small birds in the area.

TABLE I. MAMMALS FOUND ON THE ONE SQUARE MILE GRID AND AN ADJACENT 11 SQUARE MILE AREA

SPECIES AND COMMON NAME	AREA WHERE OBSERVED	
	ON GRID	OFF GRID
1. Dasypus novemcinctus - armadillo	+	+
2. Didelphis marsupialis - opossum	+	+
3 Geomys pinetis - southeastern pocket gopher	-	+
4. Lynx rufus - bobcat	+	+
5. Mephitis mephitis - striped skunk	+	+
6. Odocoileus virginianus - whitetail deer	+*	+*
7. Oryzomys paulustris - rice rat	-	+
8. Peromyscus gossypinus - cotton mouse	-	+*
9. Peromyscus polionotus - beach mouse	+*	+
10. Reithrodontomys humulis - eastern harvest mouse	+	+*
11. Procyon lotor - raccoon	+	+
12. Sciurus carolinensis - eastern gray squirrel	-	+
13. Sciurus niger - eastern fox squirrel	-	+
14. Signodon hispidus - hispid cotton rat	-	+*
15. Sus scrofa - wild pig	+	+
16. Sylvilagus floridanus - eastern cottontail rabbit	+	+
17. Vulpes fulva - red fox	-	+

*Dominant species; sighted during 80% of the field trips.

TABLE II. BIRDS FOUND ON THE ONE SQUARE MILE GRID AND AN ADJACENT 11 SQUARE MILE GRID

SPECIES AND COMMON NAME	AREA WHERE OBSERVED	
	ON GRID	OFF GRID
1. Acciptiter struitus velox - sharp-shinned hawk	+	+
2. Agelauis phaneicius - red-wing blackbird	-	+
3. Ammodramus savahharum - grasshopper sparrow	+	+
4. Ardeola ibis - cattle egret	+	+
5. Botanurus lentiginosus - American bittern	+	+
6. Buteo jamaicensis - red-tailed hawk	-	+
7. Buteo liniatus - red-shouldered hawk	-	+
8. Butorides virescens virescens - eastern green heron	+	-
9. Caprimulgus vociferus - eastern whippoorwill	-	+
10. Casmerodius abbus egretta - American egret	+	+
11. Cathartes aura - turkey vulture	+	+
12. Chlordeiles minor - night hawk	+	+
13. Colinus virginianus - bobwhite quail	+	+
14. Coragyps atratus - black vulture	+	+
15. Corvus brachyrhynchus - American crow	+	+
16. Egretta caerulea - little blue heron	-	+
17. Elanoides forficatus forficatus - swallowtail kite	+	+
18. Falco sparvirius - sparrow hawk	-	+
19. Detinia mississippiensis - Mississippi kite	+	+
20. Sturnella magna - meadow lark	+*	+
21. Turdus migratorius - robin	+	+
22. Zenaidura macroura - mourning dove	+	+
23. Unidentified Duck	+	+
24. Unidentified Goose	+	+
25. Unidentified Grebe	+	+

*Dominant species; sighted during 80% of field trips

Seventeen species of reptiles were collected or observed, with nine species recorded on the grid and twelve species from the surrounding area (Table III). Differences in faunal species composition on and off the grid due to vegetation differences can best be illustrated with the reptiles. Those species that are adaptable and occupy a variety of niches were found both on and off the grid in large numbers. The dominant species on the grid was the six-lined racerunner, and it was also one of the dominant species in the wooded area surrounding the grid. Those species whose habitat is characterized by definite vegetative type cannot adapt to the open habitat of the grid. The green anole and southern fence lizard are two of these. There are also species which occur in the forest areas but are more plentiful in the open areas, such as the eastern coachwhip.

TABLE III. REPTILES FOUND ON THE ONE SQUARE MILE GRID AND AN ADJACENT 11 SQUARE MILE AREA

SPECIES AND COMMON NAME	AREA WHERE OBSERVED	
	ON GRID	OFF GRID
1. Agkistrodon piscivorus - eastern cottonmouth	+	+
2. Alligator mississippiensis - American alligator	-	+
3. Anolis carolinensis carolinensis - green anole	-	+
4. Cnemidophorus sexlineatus - six-lined racerunner	+*	+*
5. Coluber constrictor priapus - southern black racer	+	+
6. Crotalus adamanteus - eastern diamondback rattlesnake	+	-
7. Elphe guttata tuttata - corn snake	-	+
8. Heterodon platyrhinos - eastern hognose	+	-
9. Lampropeltis doliata doliata - scarlet kingsnake	+	-
10. Lygosoma laterale - ground skink	-	+
11. Masticophis flagellum flagellum - eastern coachwhip	+	+
12. Natrix sipedon pictiventris - Florida water snake	-	+
13. Pituophis melanoleucus mugitus - Florida pine snake	+	-
14. Pseudemys scripta scripta - yellow-bellied turtle	+	-
15. Sceloporus undulatus undulatus - southern fence lizard	-	+
16. Sistrurus miliarius barbouri - dusky pigmy rattlesnake	-	+
17. Sterothaerus minor minor - loggerhead musk turtle	-	+

*Dominant species; observed during 80% of the field trips

Ten species of amphibians were collected (Table IV). The amphibian population on the grid centered mainly around the aquatic areas with the exception of the two toad species, which were also found in the dry areas. There were four breeding populations throughout most of the year in the aquatic areas on the grid: the southern cricket frog, the southern toad, the barking tree frog, and the southern leopard frog. The slimy salamander is one of the dominant species in the surrounding forest but does not occur on the grid, presumably because of its need for sufficient moist ground cover.

TABLE IV. AMPHIBIANS FOUND ON THE ONE SQUARE MILE GRID AND AN ADJACENT 11 SQUARE MILE AREA

SPECIES AND COMMON NAME	AREA WHERE OBSERVED	
	ON GRID	OFF GRID
1. Acris gryllus gryllus - southern cricket frog	+*	+*
2. Bufo quercicus - oak toad	+	-
3. Bufo terrestris - southern toad	+*	+*
4. Eurycea bislineata cirrigera - southern two-lined salamander	-	+
5. Gastrophryne carolinensis - eastern narrow-mouthed toad	-	+
6. Hermidactylium sccutatum - four-toed salamander	-	+
7. Hyla gratiosa - barking tree frog	+*	-
8. Plethodon glutinosus glutinosus - slimy salamander	-	+
9. Rana clamitans clamitans - bronze frog	-	+
10. Rana pipiens/sphenocephala - southern leopard frog	+*	+*

*A breeding population

Seventeen species of fishes were collected, with three species occurring within the boundaries of the one-square-mile grid and 15 species from the surrounding streams (Table V). Habitat and spatial isolation seemed to be the major limiting factors on the grid. The lake chubsucker was abundant in one of the ponds on the grid but was not found in the three streams within the two mile radius; however, the species occurs several miles downstream in more sluggish waters. A large percentage of these data were collected as part of a larger fish study of the three streams (Reference 7).

TABLE V. FISH SPECIES FOUND IN PONDS AND DRAINAGE AREAS OF THE ONE SQUARE MILE GRID AND IN BASIN, MULLET, AND TROUT CREEKS

SPECIES AND COMMON NAME	AREAS WHERE COLLECTED	
	ON GRID	OFF GRID
1. Ambloplites rapestris - rock bass	-	+B
2. Anguilla rostrata - American eel	-	+BT
3. Aphredoderus sayanus - pirate perch	-	+BT
4. Erimyzon sucetta - lake chubsucker	+*	-
5. Esox americanus - red-fin pickerel	-	+B
6. Esox niger - chain pickerel	-	+B
7. Etheostoma edwini - brown darter	-	+BT*
8. Gambusia affinis - mosquito fish	-	+BMT*
9. Ichthyomyzon gagei - southern brook lamprey	-	+BM
10. Ictalurus natalis - yellow bullhead	+	-
11. Lepomis punctatus - spotted sunfish	+	+BMT
12. Micropterus punctulatus - spotted bass	-	+T
13. Minytrema melanops - spotted sucker	-	+B
14. Notropis hypseiopterus - sailfin shiner	-	+BMT*
15. Notropis texanus - weed shiner	-	+B
16. Noturus leptacanthus - speckled madtom	-	+BMT*
17. Percina nigrofasciata - black-banded darter	-	+BMT*

*Denotes large population in area

B=found in Basin Creek

M=found in Mullet Creek

T=found in Trout Creek

The July 1970 study of the distribution of ant hills on the grid showed that ant hill numbers were directly related to the amount of vegetative cover. In areas with 60% to 100% vegetative cover, more than 500 hills/50 meter transect were always found regardless of whether the soil was ranked as relatively dry or wet or relatively high or low in herbicide residue. In those areas with 0 to 20% vegetative cover, the number of ant hills/transect was always less than seven regardless of moisture content or herbicide residue content.

SECTION IV

CONCLUSION

During this survey, 86 species of animals were collected or observed. Of these, 61 species (mammals, birds, reptiles and amphibians) were found off the grid area and 57% of these were also observed on the one-square-mile grid. Those animals found only in the area away from the grid included seven mammals, six birds, eight reptiles, five amphibians, and 14 fish. Ten species (one bird, five reptiles, two amphibians, and two fish) were observed only on the grid. Species such as the beach mouse, meadow lark, barking tree frog, and the lake chubsucker were more common on the grid than in the adjacent area. The beach mouse and/or the six-lined racerunner would be ideal for any future animal population studies on the grid area or in similar areas on the Eglin Air Force Base Reservation.

Because of the qualitative nature and brevity of this study and because a pre-herbicide testing base line was not available, definite conclusions cannot be drawn concerning changes in animal ecology in relation to herbicide equipment testing. However, this study does emphasize that species diversity on the grid was large among all groups of animals even though the area was repeatedly sprayed with military herbicides. Those differences that occurred between populations on and off the grid, in most cases, could readily be accounted for on the basis of previously known habitat preferences.

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13. ABSTRACT
Between May and October 1970, an animal survey was conducted on a herbicide equipment test grid (Eglin Air Force Base Test Area C-52A) and the surrounding area. The purpose of the survey was to determine species variation and distribution patterns on the test grid and within the surrounding 11 square mile area. Methods of study included night and day field trips, and observations of the young of some animals were made in the field and in the laboratory. A trapping study was conducted to determine distribution patterns for the beach mouse (Peromyscus polionotus). Eighty-six species of vertebrates (mammals, birds, reptiles, amphibians and fish) were collected or observed in the field. Sixty-one species (mammals, birds, reptiles and amphibians) were found off the grid area, and 57% of these were also observed on the one square mile grid. Those animals found only in the area off the grid included seven mammals, six birds, eight reptiles, five amphibians, and fourteen fish. Ten species (one bird, five reptiles, two amphibians and two fish) were observed only on the grid. The beach mouse and/or the six-lined racerunner (Rnemidophorus sexlineatus) populations were considered to be ideal for future studies of population distribution. This study shows that a large number of animal species inhabited or frequented the herbicide equipment testing grid during a period when the grid received repetitive applications of the military herbicides White (2,4-dichlorophenoxyacetic acid and 4-amino-3,5,6-trichloropicolinic acid) and Blue (dimethylarsinic acid); and, after a period (January 1968 to December 1969) when the grid received repetitive applications of Orange (2,4-dichloro heno-

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